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IS 9694-3 (1980): Code of practice for the selection, installation, operation and maintenance of horizontal centrifugal pumps for agricultural applications, Part 3: Operation [MED 20: Pumps]

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Indian Standard

(Reaffirmed 2001)

CODE OF PRACTICE FOR THE SELECTION, INSTALLATION, OPERATION AND MAINTENANCE OF HORIZONTAL CENTRIFUGAL PUMPS FOR AGRICULTURAL APPLICATIONS

PART III OPERATION

1. Scope — Lays down general guidelines for the operation of horizontal centrifugal pumps for agricultural applications.

2. Operation

2.1 *Priming*

2.1.1 Pumps should never be started until fully primed, that is, until they have been filled with water and all the air contained in the pumps allowed to escape. Priming may be done manually or automatically.

2.1.2 When first put in service, the waterways of the pump are filled with air. If the suction supply is above atmospheric pressure, this air will be trapped in the pump and compressed when the suction valve is opened. Priming is accomplished by venting the entrapped air out of the pump through a valve provided for this purpose. If the pump takes its suction from a supply located below the pump, it may be primed by providing a foot valve at the bottom of the suction pipe line or by filling the pump and suction line with water by opening the delivery valve or a by-pass.

2.1.3 A foot valve does not always seat tightly, and occasionally the pump cannot be primed. However, the rate of leakage is generally very small and it is possible to restore the pump to service by filling and starting it promptly. This tendency to malfunction is increased if the water contains foreign particles such as sand.

2.1.4 The pump can be filled through a funnel attached to the priming connection from an overhead tank or any other source of water. If a check valve is used on the pump and the discharge line remains full of water, a small by-pass around the valve permits the water in the discharge line to be used for repriming the pump when the foot valve has leaked. Provision should be made for filling all the waterways and for venting out the air.

2.2 *Lubrication* — It is recommended that before a pump is placed into service, its proper lubrication should be ensured.

2.3 *Starting and Stopping Procedures* — Following are the recommendations for starting and stopping the pump.

2.3.1 *Precautions to be taken before operation*:

a) *Stuffing box* — Make sure that the stuffing box has been properly packed according to **2.6**; and above all that the gland has not been tightened firmly as, otherwise, damage will occur to the packing and the shaft sleeve or shaft. It should be ensured that gland is not tightened unevenly and does not rub on the shaft sleeve or shaft. The shaft should run freely, and it should be possible to turn it by hand with ease.

b) Check the direction of rotation of prime mover with respect to pump.

2.3.2 *Starting the pump:*

a) Close the delivery valve and prime the pump. Ensure that priming of the pump is done as prescribed in the procedure laid down in **2.1**;

b) Start the prime mover;

c) If the delivery pressure does not rise continuously as speed increases, stop the pumpset and prime the pump once more, carefully;

Pumps Sectional Committee, EDC 35; *and* Horizontal Spindle Pumps Subcommittee, EDC 35 : 2 [Ref : Doc : EDC 35 (3395)]

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d) Open the delivery valve gradually and observe that pump starts delivering water;

e) Check that pump operates smoothly without undue noise and vibrations;

f) Check that prime mover does not get overloaded. If motor is coupled to the pump, check the current drawn by the motor. If the pump is driven by an engine, check that the engine does not give out smoky exhaust; and

g) Check leakage through stuffing box. Set the gland slowly to allow steady desired leakage. Observe that the gland does not get heated up.

2.3.3 *Stopping of pump*:

a) Close the valve on delivery side; and

b) Stop the prime mover.

2.4 *Restarting Motor Driven Pumps After Power Failure* — If the pump is fitted with a check valve to protect it against reverse flow, it may be permitted to restart once power has been re-established. Automatic restart of the pump depends on the type of motor control used.

2.4.1 As pumps operating on a suction lift may lose their prime during the time the power is off, it is preferable to use starters with low load protection for such installations to prevent an automatic restart. This does not apply, of course, if the pumps are automatically primed or if some protection device is incorporated so that the pump cannot run unless it is primed.

2.5 *Restarting a Pump after Long Idle Period (After Off Season Period)*

a) Replace grease if necessary for bearings and stuffing box sealing, if grease sealing is provided;

b) Check pipe lines for any blockage;

c) Check foot valve flap for its proper function; and

d) Check the stuffing box packing and replace if necessary.

2.6 *Stuffing Box* — Braided graphited cotton or asbestos packing rings should be used and instructions regarding correct installation of the packings inside stuffing box as given, should be followed:

a) The stuffing box and shaft or shaft sleeve surface must be thoroughly cleaned prior to insertion of the packing rings. Care should be taken to ensure that the working surfaces are perfectly smooth (no burrs or scores). It is equally important that the pump shaft runs free of vibration and that the clearance between shaft and bushings are adequate to ensure that the packing will not extrude into the gaps under pressure.

b) The packings in spiral form should not be inserted.

c) Packings should be installed in individual rings. Rings should be cut carefully to the exact size by wrapping the packing around the shaft or a mandrel of equal diameter which should be protected by two layers of paper. For braided packings an oblique cut of not more than 30° angle or a straight cut to give a butt joint should be made without leaving any gap at the cut joint. To avoid any fraying of the cut ends of the packing, adhesive tape may be wrapped around the section before cutting.

d) To fit the packing rings, carefully open them radially until the ends are as wide apart as half the shaft diameter, then turn the ends apart in an axial direction until the rings slide over the shaft. Now carefully push each ring into the stuffing box inserting first the joint so that the ring sits squarely against the bottom of the stuffing box or against the previous ring. The joint of succeeding packing rings should be staggered.

e) Assemble the gland ring and tighten the nuts by hand or when using a spanner only tighten to give a slight nip, allowing the packing rings to adopt easily to the packing space.

f) With the pump in operation, tighten the nuts slightly and evenly, only one or two flats at a time, to reduce leakage to the desired minimum.

g) If the shaft temperature increases by any noticeable degree, the gland nuts should be slackened back a little when fluid leakage will provide a cooling effect. When the temperature has returned to ambient, the gland nuts can be slightly tightened to reduce the leakage.

h) In the running stage proper gland adjustment and a careful watch on the temperature in the vicinity of the stuffing box will ensure good life of the packing. Care taken in fitting and at start up will amply repay in trouble free working, time and cost savings in maintenance, protection of equipment and savings on packing costs.

EXPLANATORY NOTE

One of the most important factors influencing the trouble free working of a pumpset depends upon its proper operation.

Part III of the code gives the broad guidelines for the operation of the pumpset. It is felt that in case the procedures laid down in this part of the code are followed, the pumpsets will give fairly long trouble free service.

This standard is being issued in the following four parts for easy reference:

a) Part I Selection

b) Part II Installation

c) Part III Operation

d) Part IV Maintenance

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